Remarks/Arguments

Claims 1, 3-4, and 7-9 are pending and under examination in this application. Claims 2, 5, and 6 have been canceled. The support for the amendment to claim 1 may be found in original claim 2. The support for the amendment to claim 4 may be found in original claims 5 and 6. No new matter has been added by these amendments.

The Examiner continues to reject claims 1-3 and 9 under 35 U.S.C. §102(b) as anticipated by Kayamoto et al., U.S. Pre Grant Publication No. 2003/0186156 ("Kayamoto et al."). The Examiner has rejected our arguments that comparative examples 1-3 of the present application show that using an electric furnace capable of creating a firing atmosphere (that is, a tunnel-type electric sintering furnace) results in particles with a sphericity standard deviation of greater than 0.15 and a surface uniformity of between 71% and 80%. The Examiner bases this rejection on the fact that example 3 of Kayamoto et al. shows a spherical ferrite core with a surface uniformity of 90%. Applicants traverse.

Claim 1 has been amended to recite the following:

> A resin coated carrier for an electrophotographic developer characterized by comprising spherical ferrite particles having an average particle size of 20 to 50 μm, a surface uniformity of ~~90% or more~~ <u>92 to 100%</u>, an average sphericity of 1 to 1.3, and a sphericity standard deviation of ~~0.15~~ <u>0.125</u> or less.

Claim 3 depends from claim 1, and adds the limitation that the spherical ferrite particles have an apparent density of 2.0 to 2.6 g/cm^3 a magnetization of 40 to 90 Am^2/kg in a magnetic field of 79.5 A/m, and a scattered material magnetization of 80% or more of a main body magnetization. Claim 9 covers an electrophotographic developer comprising the resin coated carrier of claim 1 and a toner.

Kayamoto et al. disclose a carrier for an electrophotographic developer comprised of an iron oxide having a spinel structure as a main body, a volume

average diameter of 20 to 45 μm, magnetization at a magnetic field of 1 KOe of 65 to 80 emu/g, electric current value for the carrier core material of 50-100 μA, and surface smoothness uniformity of 75% or more. The core is coated with a resin, and the weight ratio of the coated resin to the core material is between 0.1 to 5% by weight (see claim 1). Kayamoto et al. also teach a process for producing a resin-coated carrier for an electrophotographic developer comprising granulating a slurried raw material, firing the granules, disintegrating the fired product, classifying the resulting particles to obtain a core, and coating the core with a resin, wherein the primary particle sizes Ds10 and Ds90 of said slurry raw material satisfy the following formulas:

$$Ds10 <= 1\ \mu m$$

$$2.0 <= Ds10/Ds90 <= 10.0,$$

wherein Ds10 and Ds90 are a 10% volume diameter and a 90% volume diameter, respectively, both measured on ground particles of said raw material. (See claim 2). One preferred embodiment of this production process includes the removing step to eliminate fine particles and a heating step to remove additives utilized in the granulating process before firing the granules. In addition, the firing step is performed with an oxygen concentration of 0.05% or less, and firing temperatures of 1100 to 1350 ºC where the maximum temperature is maintained for 1 to 6 hours in the firing process, and then the product is released from the firing atmosphere at a temperature of 400 ºC or less (see claim 3).

These firing steps are described in paragraphs [0058] and [0059] of Kayamoto et al.:

> [0058] Slurry was spray dried to obtain spherical granules having an average particle size of 30 μm. Fine powder of 20 μm or smaller was removed from the granules by pneumatic classification. The additives, such as the binder, were removed by heating in a rotary kiln at 700.degree. C. The granules were fired in an electric oven capable of creating a firing atmosphere as designed under conditions of oxygen concentration: 0.05% or lower; firing temperature: 1300.degree. C.; retention time at the maximum temperature: 5 hours; and fired product temperature at release from the firing atmosphere: 350.degree. C. The fired product was disintegrated and classified to obtain a carrier core having an average particle size of 35 μm.

> [0059] The carrier core was surface treated in a continuous rotary kiln at an oxygen concentration of 21% and a temperature of 500.degree. C. and then rotated in a rotary container to be given mechanochemical stress to have an increased surface resistivity.

As is demonstrated by these paragraphs, the firing step taught by Kayamoto et al. is performed in an electric-type furnace rather than a rotary kiln, which is used for the separate steps of removing binder and increasing surface resistivity.

The resin-coated ferrite carrier according to the present invention has dissimilar properties to that disclosed in Kayamoto et al. Claim 1 recites several properties – small particle size, uniform surface properties, and higher sphericity – than the resin-coated ferrite carrier disclosed in Kayamoto et al. To achieve these properties, it is important to provide even heat treatment for the sintered material and prevention of aggregation of the particles; one method of doing so is to use fluidizing means during sintering of the resin-coated carrier. See paragraphs [0062]-[0063] of the present application).

In contrast, when an electric furnace is utilized in sintering, raw material is put into a heat resistant vessel (a sagger) and sintered in the vessel. This results in particles coming out as a cake-like block because of bonding between the particles during sintering (see paragraph [0063] of the present application). In order to obtain a powder from this cake-like block, it is necessary to shred the particles by subjecting them to mechanical stress. Since ferrites are weak in impact strength like ceramics, a large amount of stress during the shredding step will cause cracking and chipping of the particles to occur. (See Id.) This results in deformation of the shape of the particles and deviations in the surface properties of the particles, as is shown in comparative examples 1-3 of the present application. Comparative examples 1-3 of the present application all show a sphericity standard deviation of greater than 0.125 and surface uniformity less than 92%.

In addition, it is improper to assume that the unmeasured properties, such as sphericity standard deviation, are identical between the present invention and the resin-coated carrier taught by Kayamoto et al. because other measured

properties, such as average particle size and saturated magnetization, are similar. Average particle diameter and saturated magnetization are both common properties used to characterize core materials for resin-coated carriers. However, even when the values for average particle diameter and saturated magnetization are similar between two resin-coated carriers for electrophotographic developers, other properties of those developers may differ significantly. This can be seen with reference to Table 1 of the present application: the average particle size and the saturation magnetization are similar for all seven resin-coated carriers from Examples 1-3 and Comparative Examples 1-4. However, other properties – particularly the surface uniformity, sphericity standard deviation, and apparent density – differ significantly between the resin-coated carriers produced in Examples 1 and 2 and that produced in Comparative Examples 1-4.

As such, it is clear from the facts in the record that the resin coated carrier disclosed by Kayamoto et al. does not have the properties, such as surface uniformity and low sphericity standard deviation, of the present invention as claimed in claim 1. Since claims 3 and 9 depend from claim 1, it is clear that Kayamoto et al. does not anticipate the present invention.

Furthermore, the resin-coated carrier disclosed by Kayamoto et al. does not render the present claims obvious. Nothing taught by Kayamoto et al. indicates that a low sphericity standard deviation is desirable, nor does any teaching in Kayamoto et al. indicate how to achieve a low sphericity standard deviation. There is no reference in the record or teaching that shows that one of ordinary skill in the art would be motivated to modify the teachings of Kayamoto et al. in order to arrive at a resin-coated carrier with a sphericity standard deviation of less than 0.125. Further, Kayamoto et al. do not teach how one would be able to increase the surface uniformity of the particles to between 92% to 100%. Kayamoto et al. teach that a high degree of surface uniformity is desirable; however, they are unable to achieve a resin-coated ferrite carrier with a surface uniformity of greater than 90% using the production methods taught. See Example 3 of Kayamoto et al. As such, the invention of the present claims cannot be obvious over Kayamoto et al.

The Examiner has also rejected claims 4-8 under 35 U.S.C. §103(a) as unpatentable over Kayamoto et al. in view of Mizutani et al., U. S. Pre Grant Publication No. 2005/0214671. The Examiner has accepted applicants' arguments in response to the previous Office Action with respect to the rejections of claims 4-8 as anticipated by, or obvious over, Kayamoto et al. The Examiner, however, argues that claims 4-8 would be obvious over the combination of Kayamoto et al. and Mizutani et al. The Examiner argues that Kayamoto et al. fail to teach a method of making an electrophotographic developer characterized by the step of sintering the granules while the granules are made to flow by fluidizing means. However, the Examiner argues that Mizutani et al. discloses a process of forming a carrier comprising a ferrite core particle which is formed by sintering in a rotary kiln at a temperature from 1100° to 1500° C, in order to produce a spherical core with a smooth surface. Applicants traverse.

First and foremost, Applicants note that Mizutani et al. is not prior art to the present application. Mizutani et al. was filed in the United States on October 13, 2004, which is slightly over a month prior to the filing of the present application, which was filed as a PCT Application on November 25, 2004. However, Mizutani et al. was filed after JP-03-424762, filed on December 22, 2003, to which the present application claims priority. As such, Mizutani et al. cannot be prior art to the present application.

However, in addition, it is clear that one of ordinary skill in the art would not be motivated to modify the teachings of Kayamoto et al. by combining them with the teachings of Mizutani et al. to arrive at the process of the present invention. Claim 4 presently recites the following invention:

> A process for producing a resin-coated carrier for an electrophotographic developer, the process comprising weighing and mixing ferrite raw materials, crushing the mixture, granulating the obtained slurry, sintering the granules, and coating the sintered material, with a resin, characterized in that the granules are pre-sintered at 500 to 700 ºC before sintering, the sintering is performed for 0.1 to 5 hours at a sintering temperature of 1200 to 1400 ºC while the granules are made to flow by fluidizing means.

Mizutani et al. disclose a method for forming an image that does not induce problems, such as charging failure, and prevents deterioration in image quality, such as white dropout of an image, caused by attachment of a discharge product or a residual toner remaining on the surface of an electrostatic latent image carrying member. (See paragraph [0018]). In order to solve this problem, Mizutani et al. disclose a developer including a carrier and a toner including an external additive; the carrier has a median of an arithmetic average height distribution from 0.45 to 0.65 μm, and the toner has average circularity of 0.975 or more. (See paragraph [0019] of Mizutani et al.).

One of ordinary skill in the art would not be motivated to combine the teachings of Mizutani et al. with the method taught by Kayamoto et al. because Mizutani et al. disclose that it is undesirable to have a highly smooth surface, i.e. a surface with a high degree of surface uniformity, while Kayamoto et al. teach that a high degree of surface uniformity is necessary to generate uniform particles and to prevent scattering. In order to prevent residual toner from remaining on the surface of the electrostatic latent image carrying member, Mizutani et al. disclose that it is important to control the arithmetic average height distribution of the carrier particles. Mizutani et al. disclose that, if the average arithmetic height distribution of the carrier particles is less than 0.45 μm, excess toner cannot be scraped off at the developing nip part, thereby maintaining the surface of the carrying member in a clean state. (See paragraph [0047] of Mizutani et al.). As such, the object of the invention of Mizutani et al. is not to make a resin-coated carrier with a high-degree of smoothness, but instead to make a resin-coated carrier with a controlled degree of roughness between particular paramaters. One of ordinary skill in the art would not be motivated to combine the teachings of Mizutani et al. with the teachings of Kayamoto et al., because Kayamoto et al. specifically disclose that a high degree of surface uniformity is necessary to prevent wide particle-to-particle variation and particle scattering (see paragraph [0025] of Kayamoto et al.).

Furthermore, Mizutani et al. offer no guidance that would lead one of ordinary skill in the art to select a rotary kiln in order to increase surface

smoothness. An invention is not obvious to try when the prior art teaches a number of factors that may be varied in order to achieve a particular result, with no guidance as to which factors are critical or how they may be varied in order to be successful. See In re O'Farrell, 853 F.2d 894, 903 (Fed. Cir. 1988). Mizutani et al. merely teach that, in making a carrier, granulated pellets may be sintered in an electric furnace, a rotary kiln, or a batch sintering furnace, and that surface irregularity may be adjusted by controlling various conditions such as the property of raw materials, the additives, calcination conditions, sintering conditions, and pulverization conditions. (See paragraph [0066] of Mizutani et al.). Mizutani et al. do not specifically teach that selecting a rotary kiln rather than an electric furnace will increase surface smoothness, and instead indicate that higher temperatures will, instead, generate greater surface smoothness rather than the choice of any particular furnace. (See Paragraph [0066] of Mizutani et al.). One of ordinary skill in the art would thus not be motivated to modify the method taught by Kayamoto et al. by replacing the electric furnace used by Kayamoto et al. with a rotary kiln based on the teachings of Mizutani et al. As such, these two references do not render claims 4-8 obvious.

In view of the amendments and the remarks, it is submitted that the present application is now in condition for allowance. Reconsideration and allowance of the pending claims are requested. The Director is authorized to charge any fees or overpayment to Deposit Account No. 02-2135.

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